Citation:

Anderson JB, Shuster TA, Hansen KE, Levy AS, Volk A. A camera's view of consumer food-handling behaviors. *J Am Diet Assoc*. 2004; 104: 186-191.

PubMed ID: 14760565

Study Design:

Cross-sectional study

Class:

D - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To compare consumer food handling behaviors with the Fight BAC! consumer food-safety recommendations.

Inclusion Criteria:

- Household primary food preparer
- Agree to be videotaped while preparing foods in their home
- Agree to complete a food-handling survey
- Sign informed consent.

Exclusion Criteria:

- Not a household primary food preparer
- Did not agree to be videotaped while preparing foods
- Did not agree to complete a food handling survey
- Did not have a telephone
- Did not sign informed consent.

Description of Study Protocol:

Recruitment

A market research company randomly recruited participants by telephone under the pretense of market research for food preparation practices.

Design

- Participants were videotaped in their home while preparing a single entree and salad

- A food handling survey was administered
- Temperature data was collected.

Dietary Intake/Dietary Assessment Methodology

Not applicable

Blinding used

Not applicable

Intervention

Not applicable

Statistical Analysis

- Descriptive statistics were used
- The video tapes were coded to examine the relationship between consumer food preparation behaviors and the Fight BAC! recommendations
- Some behaviors not included in the Fight BAC! campaign, but deemed important such as vegetable cleaning were also coded from the tapes
- Two research assistants viewed every tenth tape and the data were compared to ensure inter-rater reliability.

Data Collection Summary:

Timing of Measurements

Participants were videotaped while preparing a meal and completed a food handling survey after food preparation and clean-up.

Dependent Variables

- Observed food safety behaviors of subjects
    - Hand washing
    - Surface cleaning
    - Cross-contamination
    - Determining doneness of the entree
    - Food storage practices
    - Vegetable cleaning.
- Measured using:
    - Three small surveillance cameras were set up around participants' kitchen in various positions and participants' hand movements were captured by switching to and recording from various cameras by a video camera technician
    - Participants were instructed to prepare the meal and handle interruptions as normal
    - The food handling survey included questions about the observed food preparation session, perceptions about food safety and foodborne illness risk, final cooking temperatures, hand washing, surface cleaning and food storage.

Independent Variables

Fight BAC! consumer food safety recommendations (i.e., relating to Clean (handwashing, surface cleaning, vegetable cleaning); Separate (cross-contamination); Cook (determining doneness of

entree, food thermometer use, internal cooking temperatures, and oven temperatures); and Chill (chilling, thawing, refrigerator temperatures).

Control Variables

Not applicable

Description of Actual Data Sample:

- ***Initial N:***
  - 92 women
  - Seven men
- ***Attrition (final N):*** N=99
- ***Age:*** Not reported
- ***Ethnicity:*** Predominately white (percentage was not reported)
- ***Other relevant demographics:***
  - Middle-class residents from a county that consists of a small urban area surrounded by rural communities
- ***Anthropometrics:*** Not applicable
- ***Location:*** A county in the Western United States.

Summary of Results:

Key Findings

- Many participants undercooked the meat and poultry entrees; very few subjects used a food thermometer (nearly one-half of subjects reported not knowing the recommended final internal cooking temperature for chicken (N=43) and ground beef (N=44))
- Chicken breast was most frequently undercooked, with 20 of 33 (61%) of subjects failing to meet the Fight BAC! temperature standards
- The final temperatures of the meatloaf ranged from 129°F to 197°F. 17 of 36 (46%) subjects undercooked the meatloaf entree according to Fight BAC! recommendations
- Many participants used inadequate storage and chilling practices for raw meat, poultry, seafood and leftovers (63 of 99 subjects stored raw meat, poultry or seafood on the middle or top shelf of the refrigerator)
- Hand washing was inadequate; only one third of participants' hand wash attempts were with soap; the average hand washing length was significantly lower than the 20 seconds recommendation
- Of the 727 failure-to-wash-hands observations, the most common (20.4%) failure-to-wash-hands behavior occurred when switching between raw meat, poultry, seafood or egg and ready-to-eat food (salad)
- Surface cleaning was inadequate; one third of participants did not attempt to clean surfaces during food preparation; only one third of surfaces thoroughly cleaned
- Nearly all subjects cross-contaminated raw meat, poultry, seafood, eggs, unwashed vegetables with ready-to-eat foods multiple times during food preparation; unwashed hands were the most common cross-contamination agent (of the 477 observed cross-contamination incidents, 84% (N=401) were from raw meat, poultry, seafood or egg to ready-to-eat food(s) and 16% (N=76) were from unwashed vegetables to ready-to-eat food(s); 94% (N=448) were indirect and 6% (N=29) were direct)

- In terms of cleaning vegetables, six subjects made no attempt to clean any of the vegetables that were used to prepare the salad; 70 subjects rinsed the lettuce, 93 rinsed the tomato, 47 rinsed the carrots, and 55 rinsed the cucumber with water
- Average washing time for vegetables ranged from 4.8 to 12.4 seconds (less than recommended 60 seconds)
- Overall, the study participants did not follow the Fight BAC! recommendations for safe food handling
- Survey data indicate that participants are vaguely aware of the Fight BAC!

Author Conclusion:

- Consumers make many food-handling errors during food preparation, increasing their risk of foodborne illness
- Dietetics professionals need to:
  - Familiarize themselves with the Fight BAC! consumer food safety recommendations
  - Understand where consumers are making food handling errors
  - Increase food safety awareness
  - Educate consumers, especially those in high risk populations about safe food handling at home.

Reviewer Comments:

The funding sources for the study were not reported explicitly.

A strength in this study is the use of direct observation method (videotaping) to capture actual food handling behavior of the participants in their homes, but authors did not discuss possible obtrusive effects (and any social desirability bias) of this method due to the presence of video cameras and the technician while preparing the meal.

Authors indicated:

- *Participants' food safety knowledge and attitude data from the food safety survey collected during the study did not correspond with their observed behaviors and survey data showed participants know more about food safety than their behavior demonstrated*
- *Participants were recruited under the pretense of market research for food preparation practices in an effort to eliminate bias for food safety research.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes

3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions

1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	No
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	N/A
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	No
3.	**Were study groups comparable?**	N/A
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A

3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	N/A
4.1.	Were follow-up methods described and the same for all groups?	N/A
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	N/A
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	N/A
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	N/A
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	N/A
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A

6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	N/A
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	N/A
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	N/A
7.6.	Were other factors accounted for (measured) that could affect outcomes?	No
7.7.	Were the measurements conducted consistently across groups?	N/A
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	N/A
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	N/A
8.6.	Was clinical significance as well as statistical significance reported?	N/A
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes

10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes